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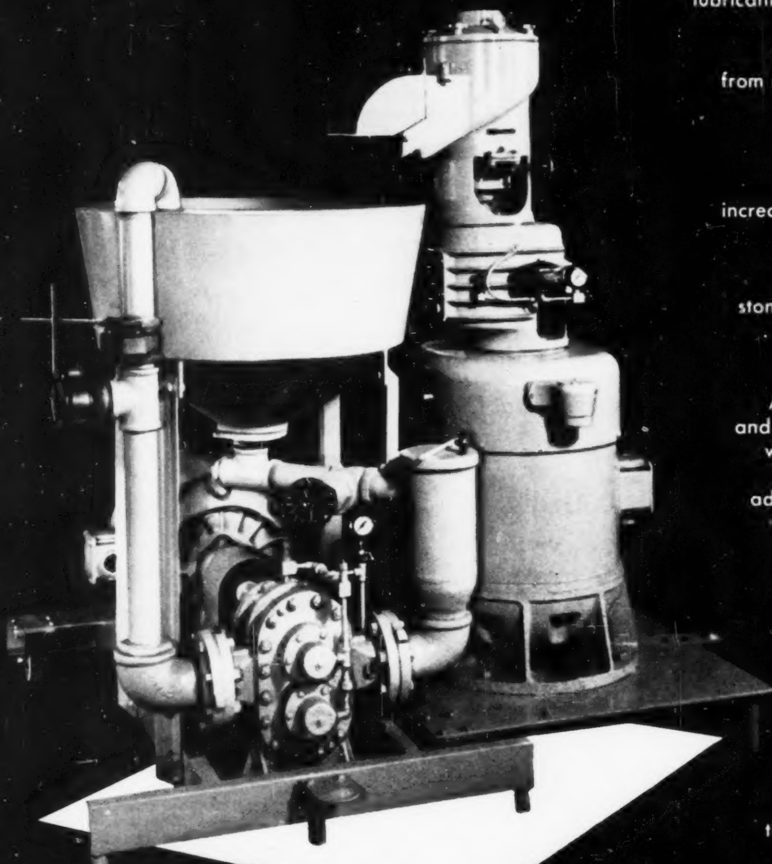

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President's page

by W. Wayne Albright, President, N L G I

SERVICE OR DISSERVICE?

The lubricating grease maker, with the research and manufacturing facilities at his command (including material made available by NLGI), tries to make the best possible grease product. Both he and his customers, the ultimate consumers, see that this fine product reaches its destination with a minimum of contamination.

An Important Link

But between the manufacturer and his customer, there is a most important link — the sales and service representative. Be he a lubricating engineer or otherwise technically qualified, in addition to representing his company and its products, he is the man who has first contact with the consumer's problems (and his complaints). He is the man who must make specific recommendations concerning the lubricating grease products he sells. He is the one who must avoid giving his customers "engineering disservice."

It is rarely satisfactory to sell lubricating grease across the counter like nails, by the pound. A vital part of such a transaction should be the engineering service which can be offered by the lubricating grease marketer.

Should Study What They Offer

Choosing a lubricating grease for a specific application is usually more than just a matter of reading the label on the package. Although the current trend is toward multi-purpose greases (and the industry is making considerable progress), the day has not yet arrived when one grease can take care of all lubricating requirements without exception.

Since it is this engineering know-how that distinguishes grease "peddling" from lubricating grease merchandising, it would be well for grease makers to re-examine periodically what they are offering their customers in the way of engineering service. (Not disservice!) The **amount** of engineering service offered will, of course, depend on the size of the marketer's organization; its **quality** need be second to none.

NLGI members can influence the lubricating grease buying public to be aware of the fine engineering service available to them along with their purchases of grease products.

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IN THIS ISSUE

ABOUT THE COVER

This month our Spokesman artist, Jim Cunningham, illustrates the drying of chemicals in general, and metallic soaps in particular, which is not as simple a process as it appears to be. It is next to the last step in the metallic soap manufacturing process yet it can be the point at which a product can become a complete loss.

A poorly designed or inadequately controlled drying setup will seriously affect the quality of metallic soaps in color and particle size. Nearly all precipitated metallic soaps are fine white powders of high bulk. Overheating or non-uniform heating seriously impairs these properties. Uncontrolled or, more properly, manually controlled drying very often results in case hardening; that is, quick drying on the outside with moisture sealed inside of the particles. This prolongs the drying operation and results in dense, gritty soaps.

The cover shows a section of Metasap's dryer installation located at Richmond, California. The drying units located at this plant were developed from a standard model specifically for Metasap's needs. Still, they fell far short of the performance expected. As is so often true, final adjustments had to be made during regular manufacturing operations. Many changes in dryer design were necessary before the high standards set for Metasap production could be assured.

The dryers as represented in the illustration are equipped with thermo regulators for exact temperature control. Their maximum variation from the set temperature is $\pm 1°$ F. The air flow inside the drying chamber is controlled by baffling which permits uniform heat control throughout the chambers.

THE CONSTANT-TEMPERATURE room is used in making pressure viscosity and other consistency tests on lubricating greases. The viscometer is visible in the background.

by L. C. Brunstrum
and H. M. Grubb
Research Department
Standard Oil Company (Indiana)
Whiting, Indiana

Flow of Lubricating Grease Between Parallel Planes

Abstract

Probably the most important single property of an oil or grease is its viscosity or body. This property determines such factors as whether or not the product will flow properly at low temperature, whether or not it may flow too fast at high temperature and how well it resists shocks or bumps.

Measuring the viscosity of a fluid oil is relatively simple, because the viscosity or resistance to flow is the same regardless of how fast it flows. With grease, however, the resistance to flow is greater at low rates of flow than it is at high rates.

In their paper the authors discuss the effect of the shape of the capillary through which the grease is forced in measuring viscosity, on the apparent viscosity.

ALTHOUGH the geometry of a viscometer enters into numerical viscosity calculations, the viscosity of an ideal (Newtonian) liquid is identical regardless of whether the cross section of the viscometer is a circle, a rectangle, an annulus, or infinite parallel planes. Thus, the viscosity-dependent performance of a practical device is closely related to the viscosity of a Newtonian lubricant.

This is not true of non-Newtonian lubricating grease; the various consistometers, penetrometers, plastometers, and viscometers seemingly do not yield concordant results. Even the less empirical ASTM Grease Capillary Viscometer (1) yields results that are employed primarily for relative estimates of performance (2, 3, 4, 5). The indefinitive nature of the result is acknowledged in the term "apparent viscosity".

Several complications prevent simple calculations of identical grease viscosities in the various instruments mentioned: 1. The flow patterns in some are inordinately complicated. An example that may never respond to anything but empirical treatment is the penetrometer. 2. Some greases are thixotropic and change viscosity during the determination. An empirical means of determining the viscosity of thixotropic grease in the ASTM viscometer is given by Wilson and Smith (6). 3. There is a lack of adequate information on the dependence of grease viscosity upon even simple flow patterns.

This paper reports a comparison of the viscosities of several conventional greases measured in the ASTM viscometer with the usual cylindrical capillaries and with special capillaries of rectangular cross section, hereinafter called circular capillaries and rectangular capillaries, respectively. These rectangular capillaries are proportioned so as to approximate flow between infinite parallel planes. This flow pattern was selected for study for three reasons: 1. Equations of simple form were available for calculation of shear rate and viscosity. Because the interplanar dimension enters as the cube rather than as the fourth power, as in circular capillaries and many other shapes, the maximum difference in grease behavior might be expected. 2. It is encountered in practice. 3. A rectangular capillary can be made readily in an ordinary machine shop as an attachment to the existing viscometer.

The equation for flow of a viscous liquid between infinite parallel planes is given by Lamb (7) as

$$\eta = \frac{P\ D^3}{12\ \frac{L}{w}\ \frac{V}{t}}$$

where V is the volume of liquid flowing in the time interval, t, through w centimeters of width; D is the distance between the parallel planes; η is the viscosity of the liquid; and L the length of the flow path across which a pressure difference of P exists. Because viscosity is defined as shear stress divided by rate of shear and wall stress F is defined as the hydrostatic force applied to the cross section of the liquid, divided by the area of liquid in shear, $F = \frac{PD}{2L}$; the shear rate $S = \frac{6V/wt}{D^2}$, and equation (1) may be written

$$\eta = \frac{F}{S} = \frac{\frac{PD}{2L}}{\frac{6\ V/t}{WD^2}}$$

This equation has been applied to the flow of grease between parallel planes in the same manner in which Poiseuille's equation is used for grease flow in circular capillaries. In practice the planes must be closed at the sides and thus form a rectangular capillary. The effect of the sides is minimized by making the capillary width large with respect to the thickness. Although an exact calculation for rectangular capillaries can be made, Barr (8) indicates that neglecting the side effects results in an error of less than 2% for the particular capillaries used. This was considered unimportant.

Apparatus and Procedure

The apparent viscosities of a variety of greases were measured by means of the ASTM apparatus fitted with four standard capillaries and two special rectangular capillaries. The ASTM method was used for both types of capillaries.

The eight greases studied are described in Table I. A waxy oil, similar to the oil in sample D, was also used.

As shown in Figure 1, each rectangular capillary was built in two parts, one flat and one slotted. Bolting together at three places along each side provided a tight seal without gasketing. Care was taken to clean each part before assembly, because the end was threaded after the parts were bolted and realignment might be difficult thereafter. The threaded end was made to replace the end cap of the ASTM apparatus.

TABLE I

CHARACTERISTICS OF GREASES

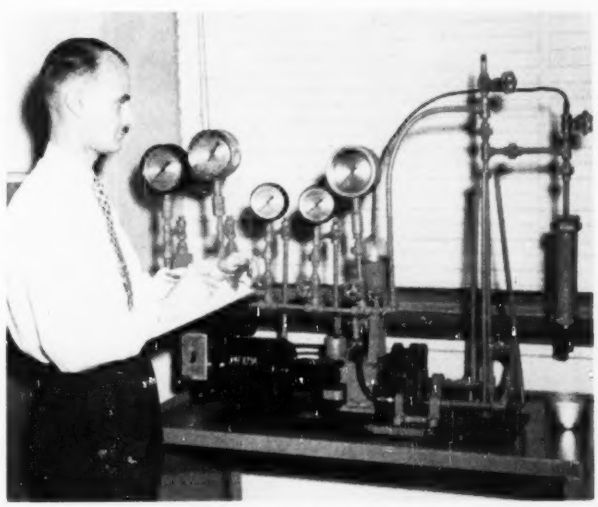
Grease	Structure	Kind of Soap	NLGI Grade	Oil Viscosity at 100° F.
A	Pour 80° F.	None[a]		......
B	Smooth	Ca fatty acid	2	300
C	Smooth	Na stearate (milled)	2	300
D	Smooth	Ca fatty acid	1	1700
E	Short fibre	Na fatty acid	2	1000
F	Fine grain	Li stearate	2	300
G	Fine grain	Bentone	1	315
H	Fibrous	Na tallow	1	490
I	Very fibrous	Na tallow	0	750

[a]Sample A is an oil having a viscosity of 200 seconds at 210° F.

Calibrations of pumps and circular capillaries were made in the manner described in the ASTM method. These calibrations resulted in calculation of the following shear rates for the capillaries when used at the three available flow rates (1):

CIRCULAR CAPILLARY NO.	C_1	C_2	C_3	C_4	C_5
1st shear rate, $sec.^{-1}$	15	61	120	230	480
2nd shear rate, $sec.^{-1}$	24	48	195	370	770
3rd shear rate, $sec.^{-1}$	39	159	315	600	1250

The dimensions of the rectangular capillaries were determined by direct measurement and are listed in Table II. The



CLOSE-UP OF THE VISCOMETER shows Robert Steinbruch recording pressure readings.

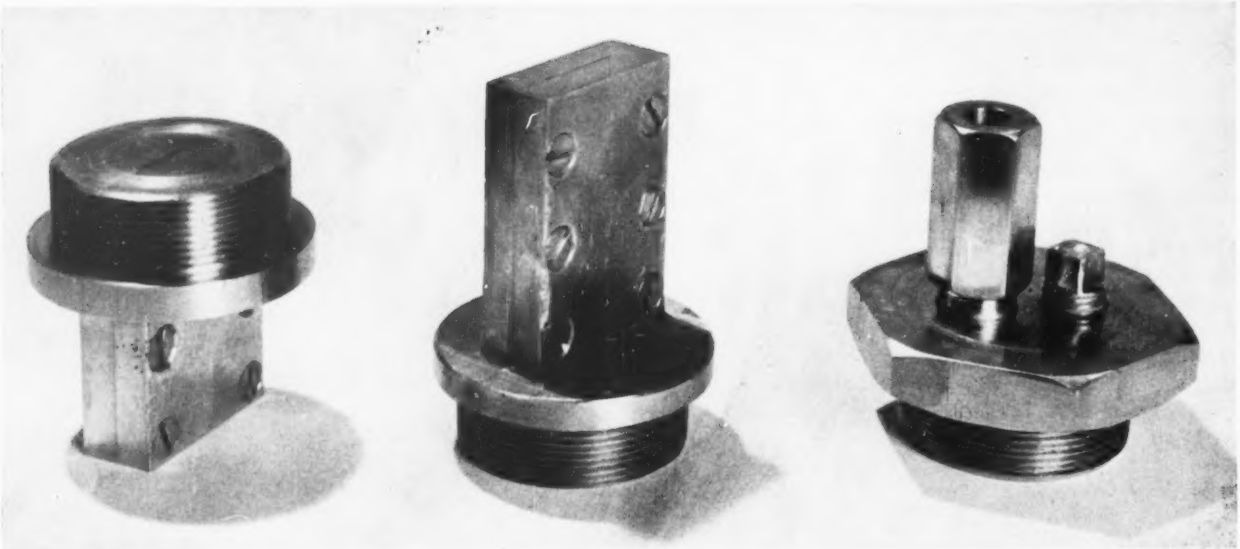


FIGURE 1

RECTANGULAR AND CIRCULAR CAPILLARIES

TABLE II

DIMENSIONS AND CALCULATED FACTORS OF RECTANGULAR CAPILLARIES

Capillary No.	R_1	R_2	R_3
Length, cm.	8.00	8.00	5.93
Width, cm.	2.00	1.99	1.99
Thickness, cm.	0.060	0.046	0.046
1st Shear rate, $sec.^{-1}$	68	118	118
2nd Shear rate, $sec.^{-1}$	109	189	189
3rd Shear rate, $sec.^{-1}$	177	307	307
Length-thickness ratio	133	174	133

TABLE III

APPARENT VISCOSITIES (POISES) OBTAINED WITH CIRCULAR CAPILLARIES

	Shear Rate, $Seconds^{-1}$							
Grease	15	24	61	98	120	195	480	770
A	117	100	84.5	74	74.7	69	63	56
B	641	430	182	119	98.3	63.5	30.0	20.9
C	650	450	203	145	127	89.0	48.0	35.6
D	393	278	139	108	101	81.4	62.2	53.6
E	802	550	303	221	202	152	88.7	72
F	1050	726	333	227	199	137	68.7	43.7
G	175	118	53.7	35	32.5	22.5	13.7	10.6
H	131	90.8	50.3	40.7	37.9	33.3	29.6	24.8
I	103	72.6	42.6	34.2	34.3	28.1	20.7	18.7

thicknesses were selected to yield shear rates typical of the medium-sized ASTM capillaries, and the lengths were chosen to provide convenient pressures with common greases. For the latter reason, the length: thickness ratio was somewhat larger than the 40:1 ratio of the circular capillaries. The shear rates shown are calculated from the capillary dimensions and the calibrated flow rates. Identical width and thickness dimensions for R2 and R3 resulted from the fact that R2 was cut off to the length:thickness ratio of R1.

Apparent-viscosity determinations were made in the ASTM manner. The tests were made in a 77° F. constant-temperature room on greases that had been stored at this temperature for at least 16 hours.

Results

The apparent viscosities obtained with the circular capillaries within the shear-rate range of 15 to 770 reciprocal seconds are shown in Table III. The characteristic decrease in apparent viscosity with shear rate was found for the waxy oil as well as for all eight greases.

The use of R1 and R2 at two flow rates resulted in apparent-viscosity determinations at four shear rates. The apparent viscosities determined at these shear rates are listed in Table IV.

A comparison of the results obtained with the two capillary shapes was made graphically on log plots of apparent viscosity versus shear rate. Figure 2 shows the results obtained on one smooth and two fibrous greases of different consistency. In every case the smooth greases showed better agreement than the fibrous products.

A numerical comparison of the difference between apparent viscosities obtained with the circular and rectangular capillaries revealed that the difference increases with shear rate. This increase is apparent in Table V, which is a comparison at the four shear rates of the rectangular capillaries. In comparing the differences obtained on the several samples,

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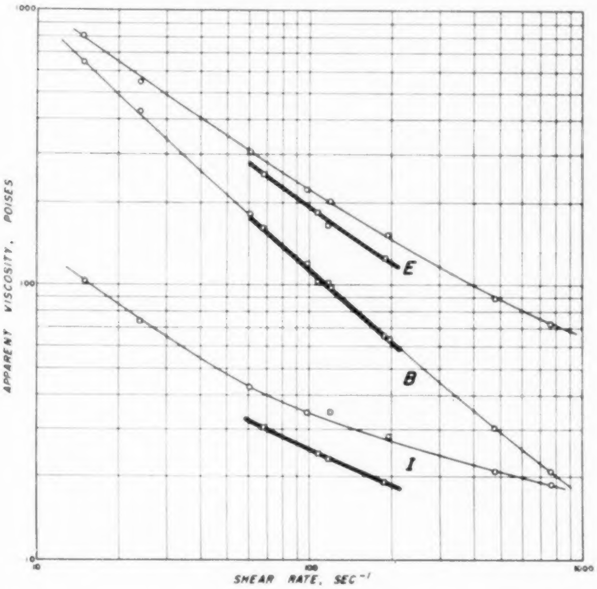
FIGURE 2

APPARENT VISCOSITY
OBTAINED WITH
CIRCULAR AND RECTANGULAR CAPILLARIES

O Circular, □ Rectangular



it was necessary to express the differences as a percentage because of the wide variation in apparent viscosities of the samples used. The percentage difference increases with fibre structure, but it is not significantly related to other grease characteristics — soap type, oil viscosity, and consistency — except insofar as they may help determine grease structure.

The dependence of per cent difference upon structure was verified in another series of tests using a grease similar to sample F. In this case the apparent viscosities were determined by means of both circular and rectangular capillaries before and after milling the grease in a colloid mill. As shown in Figure 3, the viscosity of the unmilled grease was found to be lower in the rectangular capillaries. Apparent viscosities determined on the milled grease are practically identical in the two capillary styles.

Discussion

The use of Poiseuille's equation in connection with flow calculations on non-Newtonian greases has been criticized on the basis that the equation does not fit the conditions nor lead to definitive values of viscosity. Actually, the apparent viscosity as calculated by this equation is an effective average figure at some weighted average shear rate between zero at the center and a maximum at the wall. Although the shear rate at the wall can be determined by application of the Weissenberg-Rabinowitsch equation, it is the effective values of viscosity that are of interest in flow calculations, provided that they agree with calculations obtained with a device having a shape other than that of a circular capillary and regardless of whether or not they represent definite values of viscosity.

The present work indicates that the apparent viscosity of a perfectly smooth non-Newtonian grease, as determined in a circular capillary, can be used in an equation for flow between parallel planes to arrive at a correct relation between flow rate and pressure. It is likely that this same value can be used to calculate flow in still other shapes for which the equation of Newtonian flow is known (9), because it appears probable that flow between parallel planes is most unlike flow in capillaries. As mentioned previously this premise is based on the difference in exponent associated with the smaller dimension of the flow cross section. Inasmuch as fibre greases do not appear to yield as concordant results as do smooth greases, the questions of how and why the results differ are of considerable interest.

The effect of grease structure and shear rate on the difference between the apparent viscosities as calculated in circular and rectangular capillaries is shown in Figure 4. Obviously structure is the major cause for the difference. The order of the samples agrees almost exactly with that of Table I, which was based on observed structure. However, there appears to be a difference in the degree of smoothness that is not evident by visual examination. It is not surprising that the smooth soda grease, C, is rated more fibrous than the

TABLE IV

APPARENT VISCOSITIES (POISES)
OBTAINED WITH RECTANGULAR CAPILLARIES

Grease	Shear Rate, Seconds⁻¹ 68	109	118	189
A	86.0	75.0	69.0	64.0
B	163	102	101	64.7
C	190	130	119	82.6
D	130	96.6	91.5	72.1
E	255	186	167	125
F	280	188	170	117
G	41.6	28.8	26.8	19.1
H	39.0	30.4	29.4	23.0
I	30.6	24.4	23.4	19.3

TABLE V

DIFFERENCE BETWEEN APPARENT VISCOSITIES
OBTAINED WITH CIRCULAR AND
RECTANGULAR CAPILLARIES

Shear Rate, Seconds⁻¹

	68		109		118		189	
Grease	Poises	%	Poises	%	Poises	%	Poises	%
A	-3	-3.5	1.0	1.3	1.8	2.4	6.0	8.6
B	0	0	0	0	0	0	0	0
C	0	0	5.0	3.7	7.0	5.5	9.0	9.8
D	1.0	0.8	7.4	7.1	8.0	8.0	10.6	12.8
E	25.0	8.9	25.0	12.0	25.0	12.9	24.0	16.1
F	30.0	9.7	25.0	11.8	25.0	12.5	21.5	15.5
G	8.1	16.3	5.8	16.8	5.5	16.9	4.2	18.0
H	8.8	18.4	8.9	22.6	9.0	23.5	10.4	31.1
I	9.6	23.9	8.6	26.0	8.4	26.2	8.1	29.5

THE AUTHORS (H. M. Grubb, left, and L. C. Brunstrum, right) DISCUSS results obtained with the two capillary shapes.

smooth lime grease, B, by this technique. Furthermore, the wax crystals in samples A and D apparently contribute to this difference based on structure even more than the small soap particles in samples B and D. There is no relation between per cent difference and the grade or oil viscosity of the greases, except insofar as these characteristics assist in determining structure.

Some other considerations of grease structure and apparent viscosity lead to the conclusion that the curves of Figure 4 reach the origin by becoming asymptotic to the zero per cent-difference line. At extremely high shear rates, the curves again probably approach this line.

There is a fairly simple explanation of why both structure and shear rate cause this difference in apparent viscosity as calculated from tests with the two capillary shapes. Several investigators have suggested that flow of grease results in orientation of grease fibres and in a decrease in internal friction (8, 9, 10). In a circular capillary, flow tends to orient all fibres parallel to the capillary *axis*. Flow between parallel planes, on the other hand, tends only to orient fibres parallel to the capillary *plane*. No orientation need take place within the plane. Thus in the rectangular capillary less work goes into modifying the grease structure. Because there is less orientation necessary in the case of smaller, more nearly spherical particles, results by the two methods should agree better for smooth greases than for fibrous greases. Furthermore, because increasing shear causes greater orientation, the

FIGURE 3

APPARENT VISCOSITY OF A MILLED LITHIUM GREASE

Unmilled grease used for upper pair of curves

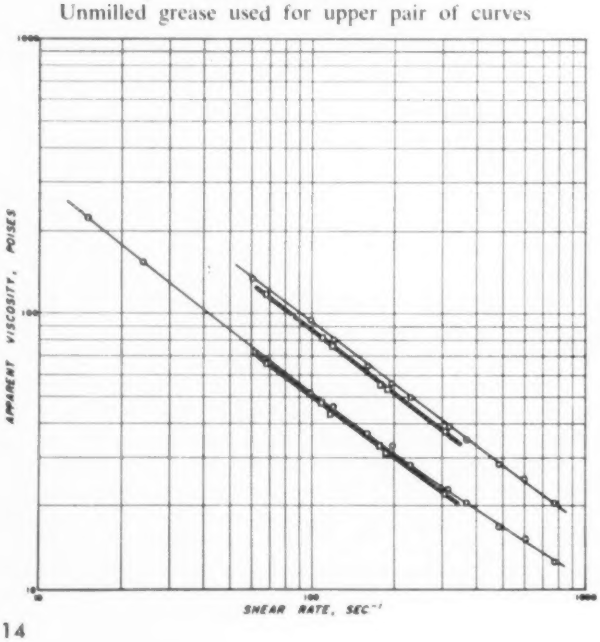


FIGURE 4

DIFFERENCE IN APPARENT VISCOSITY BETWEEN CIRCULAR AND RECTANGULAR CAPILLARIES

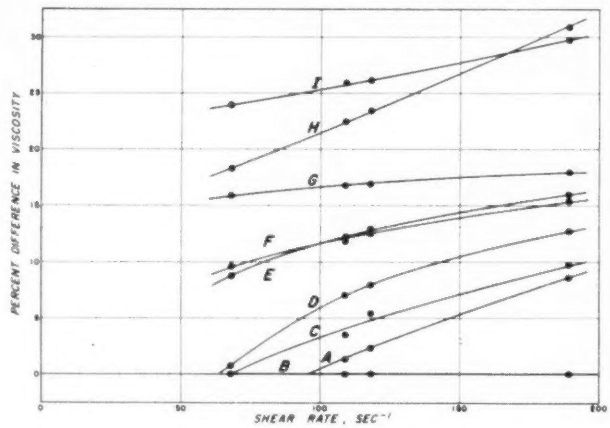
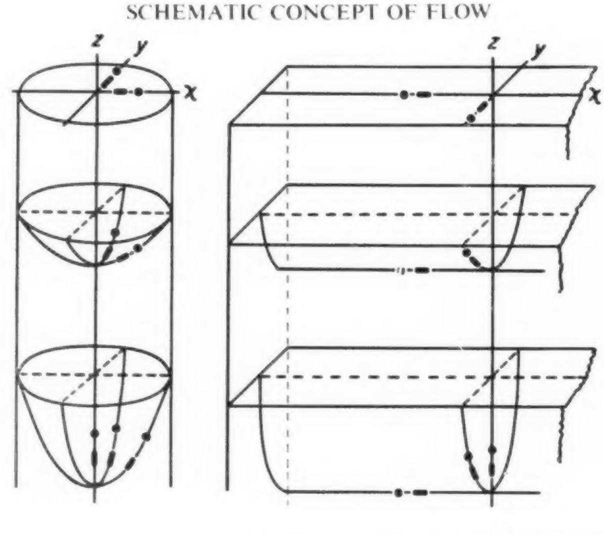


FIGURE 5

SCHEMATIC CONCEPT OF FLOW



effect is more noticeable at higher shear rates. This concept of flow is illustrated in Figure 5 wherein the no flow condition is shown at the top and successive conditions of higher shear at the center and bottom.

Currently grease technologists employ two methods of classifying grease structure. The first method attempts to describe the macroscopic structure but is arbitrary and quite confusing because there is no general agreement on terms, such as long fibre, short fibre, smooth fibre, buttery, mealy, long, short, viscous, and unctuous. The second involves electron micrographs and has not yet been closely related to flow problems. It would undoubtedly be possible to develop a numerical structure classification based upon the technique described. Such a classification would be more significantly related to grease performance than are current systems based upon visual examination. Furthermore, close agreement with microscope studies is anticipated.

Acknowledgment

The authors wish to thank Robert Steinbruch and A. C. Borg for collecting much of the data upon which this report is based.

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Discussion of 'Flow of Lubricating Grease Between Parallel Planes'

By N. Marusov
Gulf Research & Development Company
Pittsburgh, Pennsylvania

The most disturbing aspect of studies of plastic flow is that instruments of different design yield different results for the same materials. It is equally disturbing to find that laboratory data can be applied to commercial devices by empirical methods only; for example, the ability to predict the behavior of grease lubricated journal bearings from calculations alone is still unattainable. Flow behavior in large diameter tubes can be estimated only if a correction factor based on personal experience is applied to approximate results calculated on a basis of laboratory tests.

We will have come a long way toward the general solution of problems in plastic flow when comparable results are attained between the various types of laboratory instruments; and when that happens, agreement between laboratory results and the predicted behavior of lubricating greases in industrial devices should follow very shortly.

The present status of plastic flow science must be realized to appreciate fully the contribution made by Messrs. Brunstrum and Grubb. The authors brought into sharp focus a phase of greave behavior that has been heretofore, to a large measure, either unrecognized by many investigators or ignored as being of minor significance. Differences in laboratory results in amounts up to 30 per cent, as demonstrated in the subject paper, are deserving of serious examination.

The adaption of a rectangular capillary to an instrument that also uses a circular capillary eliminates many arguments which might attribute differences in results to mechanical effects. Any possible error in measurements which may be attributed either to the driving mechanism or pressure measuring method will be nearly the same for both types of capillaries, and any differences in results therefore must be due largely to the difference in shape and dimensions of the capillaries.

At the shear rates where the comparisons are made, the area of the rectangular capillary opening is about three times that of the circular capillary. At high flow rates errors in pressure measurements, because of end effects, could be expected; and these errors would be in the direction which would indicate lower apparent viscosities for the rectangular capillaries. However, at flow velocities in the region of .16 to 7.0 in. per minute, as occurred during the test reported, it is doubtful if the difference in end loss pressures would even be discernible on the pressure gage. Because of the low rate of energy input ranging between .06 to 1.0 in-lb. per second and the short period of time that the grease stays in the capillary, it is doubtful that any appreciable thixotropic difference occurred for any of the greases except Grease A, even though the length-thickness ratios of the rectangular capillaries are three to four times the length-diameter ratio of the circular capillaries. We have found that high paraffin oils which have pour points of approximately 80 F. are extremely sensitive to mechanical distortion. This extreme thixotropic characteristic may account for the exceptional results observed with Grease A. The thixotropic effect should, however, be completely explored for the purpose of obtaining the most accurate results possible for quantitative application of any constants which may develop as a result of the disclosure made by Messrs. Brunstrum and Grubb.

We also do not expect that the method by which the observed results are treated will detract from the arguments presented in the subject paper. We did not explore how the quantitative results would change when the data were applied to the Weissenberg-Rabinowitsch formula because various size capillaries were used and there were too few test points obtained with each to prepare satisfactory curves. We do expect the quantitative results to be different, but we find no reason to expect any comparative difference.

The success of a paper presented before an organized society such as the NLGI is measured by the activity that the paper stimulates. We have planned a test program for exploring the various aspects of the principle presented here with the object of obtaining precise quantitative results. We hope other investigators will initiate similar activities. The ease with which a rectangular capillary can be applied to an instrument of wide use makes it possible for other investigators to enter into the project without too much concern for equipment costs.

The authors are to be congratulated and commended for emphasizing as clearly as they do the effect of shape of the flow path on apparent viscosity measurements of greases of different fiber structure.

Patents and Developments

Lithium-Potassium Gel-Type Greases

Workable mixed-base smooth greases having good initial penetration are described in the Phillips Petroleum Company patent 2,623,017. By incorporating in a lubricating oil an amount of lithium soap having between 12-22 carbon atoms per molecule, together with a lesser amount of potassium soap having between 16-22 carbon atoms, and also with an amount of free fatty acid having between 12-22 carbon atoms, a homogeneous grease may be produced without subsequent working. It is claimed to have desirable work stability characteristics and temperature reversibility.

The amount of free fatty acid ranges between 0.1-1.5 weight per cent of the total grease. The amount of lithium-potassium soap incorporated in the lubricating oil is within the range of 10-28 weight per cent of the grease. The grease is prepared by mixing the two soaps to the oil, then adding the free fatty acid and heating to 400°-475° F. Upon cooling, the desired product is obtained.

Modified Clay Greases

"Onium" clay greases which are thickened by base-exchange clays treatd with onium compounds to replace the alkali metal cations in the clays, are now being used in the grease field. According to the Shell Development Company patent 2,623,853, such greases have a number of disadvantages, including emulsification tendency in water. However, the most serious disadvantage is claimed to be their inability to prevent corrosion of bearing surfaces in presence of water, during use of the grease. It is said that this is due to the fact that the onium ions, being chemically bound to the clay nucleus, are not readily displaced from the clay surface. At the same time, metallic surfaces, such as those found in the usual automotive bearings, are preferentially wet by water which in turn displaces the oil therefrom.

The invention involves use, as modifying agents for the clay, cationic surface active agents which are insoluble in water or highly hydrophobic. Among these are the alkyl amines, aromatic amines, heterocyclic amines, hydroxyalkyl polyalkylene amines such as amido-amines in which at least 30% of the amino nitrogen atoms are in the amino form with relatively high molecular weight organic acids, hydroxyethyl ethylene diamine, 2-hydroxy-1, 3-diamino-propane, condensation products of monohaloepoxyalkanes with ammonia or a low molecular weight amine, partial amides, etc. A specific modifying agent claimed is a tall oil partial amide of a condensation product of epichlorohydrin and ammonia.

The bentonitic clay has adsorbed on it 25-100% (by weight of the bentonite) of the above modifying agent. Synthetic zeolites also may be used as the base.

Besides mineral lubricating oils, these modified clays can be used to thicken various synthetic oils. Since the patent discloses a very complete list of such oils, it is considered to be of sufficient importance to be recited here:

I. Synthetic Lubricants produced by the Fischer-Tropsch, Synthol, Synthine and related processes, e.g.:

A. Polymerization of olefins such as ethylene, butylene, and the like, and their mixtures in presence of a Friedel-Crafts or other type condensation catalyst under elevated temperatures and pressures.

B. Polymerization of unsaturated hydrocarbons in presence of a catalyst and then condensing said polymerized product with an aromatic hydrocarbon such as xylol, benzol, naphthalene, etc.

C. Oxidation of polymerized olefins of lubricating range as noted under A and B.

D. Process of converting natural gas to carbon monoxide and hydrogen, followed by catalytic reaction under elevated temperature and pressure to produce hydrocarbons of lubricating range (Synthol process).

II. Synthetic lubricating products produced by the Bergus process, e.g., by:

A. Hydrogenation of coal, peat, and related carbonaceous materials under pressure and elevated temperature in presence of a catalyst.

B. Hydrogenation of asphalts, petroleum residues and the like.

III. Synthetic lubricants produced by the Voltolization process, e.g., by:

A. Voltolization of fatty materials such as fatty oils.

B. Voltolization of mixtures of fatty oils and petroleum hydrocarbons.

C. Voltolization of unsaturated hydrocarbons, their mixtures, and the like.

IV. Organic synthetic lubricants:

A. Alkyl esters of organic acids, e.g.:

- Alkyl lactates
- Alkyl oxalates
- Alkyl sebacates (2-ethylhexyl sebacate)
- Alkyl adipates
- Alkyl phthalates (dioctyl phthalate)
- Alkyl ricinoleates (ethyl ricinoleate)
- Alkyl benzoates

B. Alkyl, alkylaryl esters of inorganic acids, such as the phosphorus esters.

Organic phosphorus esters including phosphates, phosphonates, phosphinates, as well as the corresponding oxides. Typical species include:

Tricresyl phosphate
Trioctyl phosphate
Tributyl phosphate
Bis (3,5,5-trimethylexyl) 2,4,4-trimethylpentene phosphonate
Tris (3,5,5-trimethylhexyl) phosphate
N-heptenyl bis (3-butylpentane) phosphinate
Bis (3,5,5-trimethylhexane) octane phosphine oxide

Diphosphorus compounds including the four classes referred to above. Preferably, the diphosphorus compounds have a configuration as follows:

$$A\left[\begin{array}{c} (O)-R \\ |\,{\scriptstyle 0\text{-}1} \\ {\scriptstyle 0\text{-}1}(O)-P=O \\ | \\ (O)-R \\ {\scriptstyle 0\text{-}1} \end{array}\right]_2$$

wherein A is an organic radical preferably aliphatic or aromatic hydrocarbon radical or alternatively an oxahydrocarbon

radical or the corresponding sulfur, selenium or tellurium containing hydrocarbon radicals preferably saturated aliphatic hydrocarbon radicals having from 4 to 12 carbon atoms. The above configuration contemplates diphosphates, diphosphonates, diphosphinates and diphosphine oxides. A particularly desirable configuration comprises those diphosphates having the following configuration:

$$\begin{array}{ccccccc} & OR_1 & & & & OR_1 & \\ & | & & & & | & \\ O= & P & —O— & R_1 & —O— & P & =O \\ & | & & & & | & \\ & OR_1 & & & & OR_1 & \end{array}$$

wherein each R_1 is an aliphatic hydrocarbon radical having from 2 to 6 carbon atoms. It has been found that lubricants of this particular configuration possess unexpectedly extreme low temperature operating characteristics. Species of such lubricants include:

1, 4-butanediol bis(dibutyl phosphate)
1, 3-propanediol bis(diamyl phosphate)

V. Synthetic lubricants made by polymerization of alkylene oxides and glycols at elevated temperatures in the presence of catalysts such as iodine, hydriodic acid, etc.:

A. Polymers of alkylene glycol:
- Trimethylene glycol
- Propylene glycol
- Tetramethylene glycol
- Hexamethylene glycol
- Pentamethylene glycol

B. Copolymers of:
- Trimethylene glycol and triethylene glycol
- Trimethylene glycol and hexamethylene glycol
- Trimethylene glycol and diethylene glycol

C. Copolymers prepared from certain epoxides at elevated temperatures and in presence of KOH or BF_3—ether catalyst, e.g.:
- Ethylene oxide and propylene oxide
- Isobutylene oxide and propylene oxide
- Epichlorohydrin and propylene oxide

D. Sulfur containing polymers obtained by treating allyl alcohol, divinyl ether, diallyl ether, diallyl sulfide, dimethallyl ether, glycols, with H_2S in presence of a catalyst such as toluene sulfonic acid, peroxides, ultraviolet light, e.g.:
- Dihydroxy diethyl sulfide
- Dihydroxy dipropyl sulfide
- Trimethylene glycol and dihydroxy dipropyl sulfide
- Trimethylene glycol and dihydroxy diethyl sulfide

VI. Polymers obtained from oxygen-containing heterocyclic compounds, e.g., polymerization of tetrahydrofuran in the presence of a catalyst.

VII. Silicon polymers, e.g.:
- Polyalkyl siloxane and silicate polymers
- Alkylaryl siloxane and silicate polymers
- Dimethyl siloxane and silicate polymers, etc.

Salts of Oxy Acids in Complex Soap Greases

As has been brought out previously in earlier Standard Oil Development Company patents, the addition of salts of low molecular weight compounds appears to be particularly ad-

vantageous in connection with greases of alkali and alkaline earth metal soap bases. Improvement in physical structure, greater stability against oxidation, and greater receptiveness to the action of antioxidants are claimed.

In U. S. Patent 2,623,854, this company proposes the use of salts of certain low molecular weight oxy acids for this purpose, thereby obtaining an improved grease suitable for use on anti-friction bearings at temperatures of 300°-350° F. and even higher.

Such oxy acids contain an ether linkage, and are exemplified by methoxypropionic acid, isopropoxypropionic acid, isopropoxyacetic acid, phenoxyacetic acid, phenoxybenzoic acid, etc. Soaps of acids such as levulinic (which really is not an oxy acid) give relatively low dropping points and poor structural characteristics. Formulations containing salts of oxy aromatic acids have the added advantage of low water solubility and high wetting ability for metal surfaces covered with water.

This oxy salt is used in the proportion of 1 to 2 parts of the salt to 1 to 3 parts of the alkali metal conventional fatty acid soap. One example shown has the following composition:

Ethoxypropionic acid	6.0
Hydrogenated fish oil acids	15.0
Sodium hydroxide	4.4
Phenyl alpha naphthylamine	1.0
Mineral lub. oil of 500 S. U. S. vis. at 100° F. (55 at 210° F.)	73.6

This gave a yellow, smooth, short fiber grease with a dropping point of 446° F. and a worked penetration of 306 mm/10. Comparisons with other types of greases are given.

Water Resistant, Inorganic Colloid-Thickened Greases

Water resistant greases of improved roll stability and containing a combination of inorganic colloid and organic soap as thickener, are described in the Shell Development Company patent 2,625,508. It has been found that lubricants containing oleaginous materials thickened to a grease-like consistency and containing at least a thickening amount of inorganic colloids may be materially improved by addition of a minor amount of a hydrophobic metal soap of an organic acid.

The colloidal gel includes substances such as inorganic oxides (ferrous, ferric, vanadium, magnesium-silicon, aluminum-silicon, etc.). Typical thickeners are lime and magnesium oxide. Calcium sulfate or silicate also may be used. The colloidal gels used preferably have an approximate surface area of 200-750 sq. m. per gm.

The hydrophobic metal salts used include, as a preferred group, the amphoteric metal salts, such as aluminum soaps of higher fatty acids. Lithium 12-hydroxy stearate also is a preferred soap. The metal radicals may include Cu, Co, Ni, Cd, Hg, Sr, Zn, Pb and Fe. A special group of useful soaps includes the alkyl or alkenyl-substituted aliphatic dicarboxylic acid soaps in which the alkyl or alkenyl chains have 8-18 carbon atoms. High molecular weight sulfonic soaps also are suitable.

One example discloses a grease prepared by milling 7% by weight of a mixture of 2 parts alumina aerogel and 1 part lead oleate with 93% bis(2-ethyl-hexyl) sebacate to produce a grease having excellent water-resistant properties.

Bleeding and Aging-Resistant Greases

The addition to a grease composition of a minor amount of an oxidized petroleum hydrocarbon rich in aromatics having an aniline point of 25° to 65° F. is proposed in the Shell Development Company patent No. 2,625,510 as a means for improving aging-and bleeding-resistance. Mixtures of the oxidized aromatic-rich petroleum hydrocarbons with nitrogenous or sulfurous fractions also can be used.

Table I gives the properties of typical petroleum distillates useful for the extraction of aromatic fractions which are to be oxidized for this purpose.

TABLE I

PROPERTIES OF PETROLEUM DISTILLATE SOURCES

Sample	A	B	C	D	E	Range of products
Viscosity, SUS at 210	60	39.5	50.3	70.5	158	20-200
Aniline point, ° F.	64.8					
Viscosity index	—53	90	90	95	92	—100 to +100
Average molecular weight	364					225-650
Flash, ° F.		370	445	500	570	350-600
Per cent aromatics		15	9	12		2-25

Table II gives the properties of suitable aromatic fractions prior to oxidation.
The extraction may be effected with sulfur dioxide or by any other solvent.

Table III presents the properties of several typical oxidized aromatic fractions, together with the conditions of oxidation.

The amount of oxidized products used as an additive may vary over wide limits, but preferably is between 4-10% of

TABLE II

PROPERTIES OF AROMATIC FRACTIONS PRIOR TO OXIDATION

Sample	A	B	C	D	E	Range of products
Viscosity, SUS at 210° F.	106	48.7	66.8	446	1,358	45-1,500
Iodine No. (Wijs)	100	96	84	105	113	80-150
Aniline point, ° F.	32					25-75
Distillation, 1 mm.:						
IBP, ° C.	182	135		187	217	125-225
95%, ° C.	293	239	256	301	346	225-400

the total composition. They can be added to the grease at any time during or after the cooking operation.

Figure 1 shows a comparison in time-penetration between a soda base grease containing 5% of such oxidized Edeleanu extract and one containing the same amount of non-oxidized extract. In this case, the extract was allowed to oxidize in an open kettle in the grease.

FIGURE 1

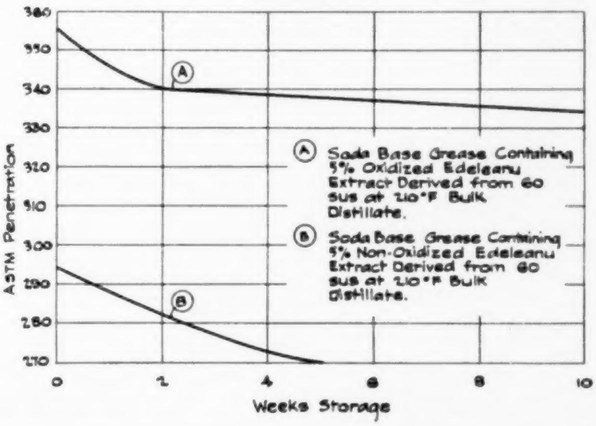


TABLE III

PREPARATION AND PROPERTIES OF OXIDIZED AROMATIC FRACTIONS

Sample	A	B	C	Range of products
Source	Furfural extract of bulk distillate, 200 SUS at 210° F.	SO_2 extract of bulk distillate, 100 SUS at 210° F.	Duo-Sol extract of a bulk distillate.	
Air blowing conditions:				
Time, hours	4.4	4.7	5.9	0.5-8
Temp., ° F.	430	430	430	300-500
Oxidation during grease formation, temp., ° F.				175-410
Properties of blown product: Acid number (mg KOH/g).	0.45	0.45	0.30	0.25-5.0
Approx. per cent hydrocarbons:				
Oxidized	1%	1%	0.7%	0.5-25.0
Flash, ° F.	475	470	500	400-600
Softening point, ° F.	121	120	123	0-200

PEOPLE in the Industry

Rossini Will Deliver Edgar Marburg Lecture

Dr. Frederick D. Rossini, Silliman professor and head of the department of chemistry and director of the American Petroleum Institute research laboratory at the Carnegie Institute of Technology, will present the 27th Edgar Marburg Lecture on "An Excursion in Petroleum Chemistry."

This lecture, given at the annual meetings of the American Society for Testing Materials, originated as a testimonial to the first secretary of the society and was established to emphasize the importance of furthering knowledge of properties and tests of engineering materials.

The 1953 ASTM annual meeting will be held in Atlantic City during the period June 29 through July 3 and on Wednesday afternoon, July 1, Dr. Rossini will deliver the Edgar Marburg Lecture. He will describe outstanding developments in our knowledge of petroleum. Dr. Rossini will outline the interesting story of fundamental research in petroleum chemistry as performed in the laboratories of petroleum companies. He will discuss projects supported cooperatively by the petroleum industry through the American Petroleum Institute, and in particular will review API research projects covering the composition of crude petroleum and the researches conducted in order to make available to the laboratories of the petroleum industry in particular, and to the technical world in general, all of the known data on hydrocarbons and related compounds. This extensive laboratory work also involved searching the entire scientific literature field, appraising and arranging data in a useful form and distributing this data both on a national and international scale.

Dr. Rossini has achieved renown as an authority in the field of physical chemistry. He has a broad background as an educator, lecturer, scientist and author, and years of service as a leading member of ASTM Committee D-2 on Petroleum Products. Dr. Rossini has a deep personal interest in teaching and has lectured at leading universities throughout the country. In 1946, Dr. Rossini was elected president of the Commission on Thermochemistry of the International Union of Pure and Applied Chemistry, having been nominated in 1934 as the United States member of the commission. He is the author or co-author of approximately 150 scientific papers dealing with thermochemistry and hydrocarbons.

Morehouse Plans Tour For Director Of Exports

Around the world by air in 90 days with stopovers in 50 countries! That's the whirlwind trip planned by Norman W. F. Klein, director of exports for Morehouse Industries of Los Angeles, manufacturers of grinding and processing mills. Mr. Klein left in April via Pan American Airways with Honolulu as his first stop.

He will visit Hawaii, Japan, North, Central and South Africa, Central and South America and the major countries in Europe, the Near East and the Far East to tell customers and prospects about Morehouse processing mills and to provide present distributors and customers with technical assistance in solving special processing problems. He will also assist present agents in installation and operating methods and will seek new distributors and sales outlets.

Morehouse mills are used in the grinding and processing of a varied list of products including paints, greases, chemicals, foodstuffs, ceramics and cosmetics. They employ the exclusive Morehouse principle of feeding the material to be processed between the surfaces of a stationary Carborundum stone and a special Carborundum stone revolving at high speed.

D. L. GRUBBS, left, and NORMAN W. F. KLEIN

Mr. Klein, well-known in European industrial circles, was born in Holland and formerly was connected with a major American oil company at The Hague.

A. Gross Salesman Wins $500 Scholarship Award

Joseph L. Kearns, metropolitan salesman for A. Gross & Co., manufacturers of fatty acids, has just been awarded a $500 scholarship for advertising, publicity or marketing studies by the Advertising Club of New York.

The award was given as first prize in an essay contest conducted by the Advertising Club upon completion of its course in advertising and selling.

Industry NEWS

Alemite Division Offers New Lubrication Fitting

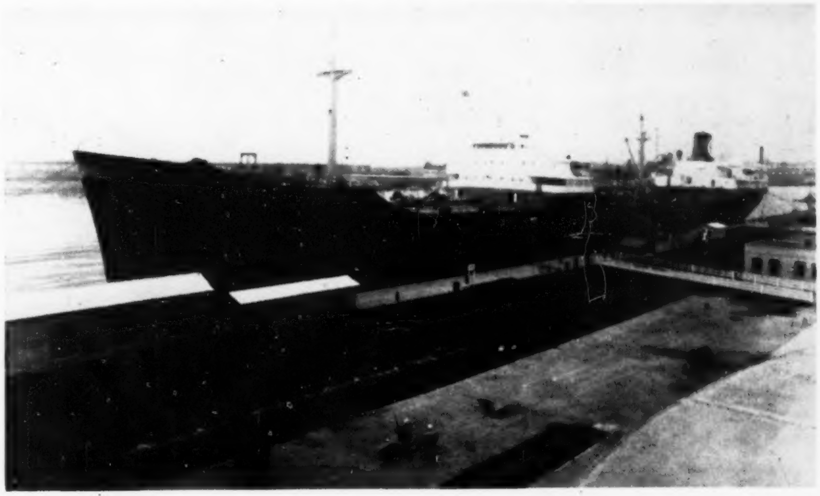
An Alemite lubrication fitting, featuring three checks against loss of lubricant, line fluids or gases and especially designed for use on lubricated plug valves, where extreme back pressures are encountered, has been announced by the Alemite Division of Stewart-Warner Corporation.

For particular use in the oil and gas industry, chemical plants, paper mills, refrigeration plants, sewage disposal plants, etc., the Alemite fitting features two ball checks augmenting the standard check valve at the top of the fitting, thus giving protection against escape of line fluids as well as making it practically impossible for foreign matter to foul all checks at the same instant, according to Gus Treffeisen, distribution sales manager of Alemite.

The "triple check" fitting permanently replaces the lubricant screw so that the lubricant may be injected into the valve directly from a hand gun or bucket pump, thereby cutting labor costs by reducing lubrication time and establishing a more positive lubrication of all valve lube ports regardless of back pressure, Mr. Treffeisen said.

These fittings can be serviced by an extra heavy duty booster-type hand gun developed by Alemite engineers for lubricated valves with either cartridge or bulk lubricants. This hand gun develops 15,000 lbs. pressure to offset the back pressures of the line. A heavy duty lever gun which develops 10,000 lbs. pressure is well-suited for lubricated valves where only soft bulk lubricants are used. Alemite bucket pumps, which enable the operator to lubricate an entire day without refilling the pump, features a similar "booster" action as Alemite hand guns—whereby the primer forces the lubricant into a high pressure piston where the pressure is "boosted" and the lubricant is discharged through the delivery hose. The bucket pumps provide delivery of all soft lubricants in any type of weather at pressures up to 15,000 lbs. These units, featuring a small diameter tank and a carrying handle over the center of the pump, make them easy to carry from one point to the next.

Largest Tanker Brings First Arabian Oil



CARRYING 190,000 BARRELS of crude oil, first to be delivered in Los Angeles Harbor, the Kentucky, Texas Oil Company tanker, ties up at Berth 172. With a length of 624 feet and an 84-foot beam, the ship was the largest tanker ever to enter the harbor. Her oil capacity is 240,000 barrels. She sailed from Sidon, Lebanon, end of the Saudi, Arabian oil line.

Emery Announces Higher-Purity Pelargonic Acid

Emery Industries, Inc., announces the availability of a new improved grade of pelargonic acid in experimental and pilot quantities. This new product is representative of material expected from Emery's new ozone-oxidation plant which should be in operation by mid-1953.

The typical composition of Emery's pelargonic acid is as follows:

Pelargonic Acid ($C_8H_{17}COOH$)	91%
Caprylic Acid ($C_7H_{15}COOH$)	5%
Capric Acid ($C_9H_{19}COOH$)	4%

Compared with prior grades of commercially available pelargonic acid, this should make an excellent, low-cost raw material where a medium molecular weight, saturated, aliphatic acid is required.

A technical bulletin containing tentative specifications, typical characteristics, typical reactions, and applications is available on request. Address all requests to:

Emery Industries, Inc.
Dept. 5 Carew Tower
Cincinnati 2, Ohio

Deep Rock Registers 'Short Stop' as Name For Multi-Pump Stations

"Short Stop," a name applied to multi-pump super stations, has officially become the exclusive property of Deep Rock Oil Corporation, the company has disclosed.

The U. S. Patent Office, in a move that is believed to be a precedent under the Lanham Act of 1946, has formally granted a certificate of registration to Deep Rock for the unique service mark. The name was originated by Deep Rock to indicate the fast-in, fast-out type of service offered at the first two mammoth filling stations in Omaha, Neb., and Chicago, Ill.

Officials said registration of the "Short Stop" name marks the first time under the Lanham Act that such a certificate has been granted for a service mark which is not used on goods of any type.

The Omaha station was the first Short Stop super station in the country. A pioneer in the mushrooming field of super stations, the Omaha Short Stop was one of the first stations to install such revolutionary features as custom-built

nonglare floodlighting; marquee-type billboard signs with plastic letters that can be changed in minutes; and pump islands at right angles to street traffic to permit speedier drive-in service.

Success of the Omaha Short Stop prompted construction of the second Short Stop super station, this one on Chicago's busy Northwest Highway.

The Chicago Short Stop has already been turned over to an independent businessman for operation. All future Short Stop super stations will also be relinquished by Deep Rock in line with the company's policy of allowing independent men to operate their own businesses. But most importantly, the entire Short Stop plan is packaged for, and readily available to, Deep Rock franchised jobbers in whose area this most unique multi-pump operation would be feasible.

This distinctive type of service station operation is one phase of Deep Rock Oil Corporation's unique marketing program known as the Deep Rock Plan.

Under this program, established in 1949 at a meeting of Deep Rock and independent jobbers, the company withdrew from direct marketing operations, thus permitting hundreds of independent businessmen to operate their own establishments.

The company services the independent jobbers and cooperates to the fullest extent by way of service station operation and sales promotion.

Organization Plans Made For Atomic Industrial Forum

Incorporation papers for an organization of businessmen, engineers, scientists and educators interested in the industrial development and application of atomic energy for peaceful uses have been filed with the Secretary of State in Albany.

Presidents or key atomic energy executives of 13 corporations and institutions of higher education were named as directors of the group, which will be known as the Atomic Industrial Forum, Inc. The forum will have its present headquarters in the Engineering Societies Building, 29 West 39th Street, in New York.

Members of the Board of Directors of the forum are: Albert L. Baker, chairman, Vitro Corporation and Vitro Manufacturing Company; Walker L. Cisler, president, The Detroit Edison Company; John L. Collyer, president, B. F. Goodrich Company; Dr. T. Keith Glennan, president, Case Institute of Technology; Dr. Frederick L. Hovde, president, Purdue University; Alfred Iddles, president, Babcock & Wilcox Company; John A. Martino, president, National Lead Company; John R. Menke, president, Nuclear Development Associates; Admiral Earle W. Mills, president, Foster-Wheeler Corporation; Dr. Mark E. Putnam, executive vice president, The Dow Chemical Company; Ross W. Thomas, vice president, Phillips Petroleum Company; Howard G. Vesper, vice president, Standard Oil Company of California, and J. B. Woodward, Jr., president, Newport News Shipbuilding & Dry Dock Company.

The association was formed as a result of a proposal by Dr. Glennan shortly after he had resigned as a member of the Atomic Energy Commission and resumed the presidency of Case. Dr. Glennan's suggestion, which was made before the Manufacturing Chemists' Association last November, was that an organi-

(Continued on page 30)

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Responsible for the operations of a modern blending and packaging plant which is a part of a complete refinery of an independent oil company in the Southwest. Must have thorough knowledge of drum reconditioning, drum and can filling, box car shipping, and lube oil blending operations. College degree preferred. Salary open subject to experience and qualifications. Box 306, The Institute Spokesman.

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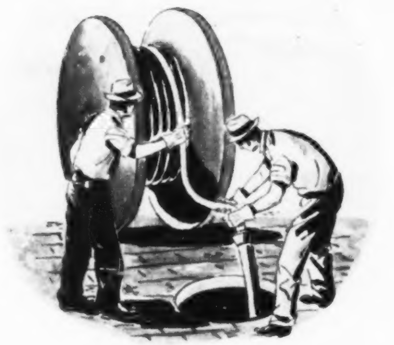


(Continued from page 27)

zation of business and other interests concerned with non-military development of atomic energy should be formed to help further the advancement of this energy source. It should be independent of government, he said, and the over-all results of its activities should be to further the development of this new industry.

A broad membership of all businessmen, engineers, scientists, educators and others involved or interested in atomic energy as a new and promising industry will be sought by the forum, it was stated by its founders. There will be two classes of membership. Regular memberships will be open to individuals who are lawfully entitled to access to any "restricted date" as defined in the Atomic Energy Act of 1946. Special membership will be open to individuals, corporations, associations, partnerships and trusts which are now or expect to be engaged in research, development or operations in atomic energy. Only regular members will have voting privileges and be eligible to serve on the forum's board of directors.

Measurement Tables Issued By ASTM for Petroleum

Of world-wide interest and significance is the publication of the eagerly-awaited ASTM-IP Petroleum Measurement Tables. This material, prepared jointly by the American Society for Testing Materials and the Institute of Petroleum, Great Britain consists of a comprehensive group of tables, standardized on an international basis for the calculation of the quantities of crude petroleum and petroleum products in any of three widely-used systems of measurement. Three separate editions: "The American", "British", and "Metric" are now available. Begun in 1946, the tables are the result of many years of intensive co-operative work by ASTM and IP.

The tables have been developed specifically to meet the needs of all those concerned with purchase, sale, consumption, and handling of petroleum and petroleum products. An important factor in their development was an appreciation of the extent to which oil is shipped from country to country and a recognition of the importance of using internationally recognized conversion factors to eliminate a possible source of disagreement in volume and/or weight as determined by shipper and receiver.

The 39 tables include data for all conversions given in the six tables of National Bureau of Standards Circular C 410 and cover additional useful ranges of temperature and gravity. Furthermore, many additional tables are provided to facilitate weight and volume conversions where more than one system of measurement is involved.

Tables are provided over normal operating ranges for the reduction of gravity and volume to standard temperature, for calculation of weight-volume relationship, and interconversion of a wide variety of commercially useful units. These tables are expected to apply to crude petroleum regardless of source and to all finished petroleum products derived therefrom regardless of method of manufacture.

The American Society for Testing Materials has published all tables applicable to the units of measurement used in the United States, while the Institute of Petroleum, Great Britain, has published those applicable to units employed in the British Commonwealth. In addition, the IP has published a volume in metric units. Not all of the tables are available in each of the three editions. Detailed Tables of Contents for the various editions are available from ASTM Headquarters.

The tables are printed in large legible type and an easily-followed example with explanatory information is provided with each table. For bench usage individual tables may be purchased.

All three editions may be secured from Headquarters of the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Prices are as follows: American Edition, $8.75 (544 pages); British Edition, $7.00 (432 pages); Metric Edition, $7.70.

OIIC Plans to Release Film, 'American Frontier'

The Oil Industry Information Committee has announced that its new motion picture, which will be released next fall during Oil Progress Week, will dramatize the story behind the story of the discovery of oil in the Williston Basin in North Dakota.

Appropriately, the title of the new film will be "American Frontier."

It will show how the discovery of oil in April 1951, changed the whole economic and social development of a section of modern America; how the first

successful well put new life and new meaning into a rural area where farmers and ranchers alike had depended upon the vagaries of the weather and a single crop.

The 1953 motion picture will be a real-life documentary, a true story using Williston Basin residents as its cast. It will record the day-by-day bustle and transformation that takes place in the development of a new frontier.

Location photography, which required two months of hard work in the frigid farm land, already has been completed. Camera crews, because of the sub-zero weather, were forced to use heaters and warmers for their equipment. Parkas, snow sleds and similar arctic accessories were mandatory accoutrements as the photographers bucked 20-foot snow drifts and freezing weather.

"American Frontier" will be premiered on a national basis next October when the industry observes Oil Progress Week. It will be made available at the time for television showings, for schools, meetings of business, professional and social clubs, theaters and other interested users.

It will be a companion to other OIIC motion pictures such as "Crossroads, U.S.A.," "Man on the Land," "24 Hours of Progress," and "The Last Ten Feet." Three of these motion pictures were awarded honor medals by Freedoms Foundation, Inc., for their excellence in advancing this country's concept of freedom and enterprise.

The OIIC Film Subcommittee in direct charge of the project is headed by H. L. Curtis, of Shell Oil Co., New York. Other members are P. C. Humphrey, The Texas Company, New York; George L. Randall, Richfield Oil Corp., Los Angeles; Reynolds Girdler, Sinclair Oil Corp., New York; Conger Reynolds, Standard Oil Company (Indiana), Chicago, and E. A. Williford, Continental Oil Company, Oklahoma City, Okla.

Service Station Advisory Committee Approved

Approval of the establishment of a new Service Station Advisory Committee and appointment of Charles Z. Hardwick of the Ohio Oil Co., Findlay, O., as its first chairman were announced by R. M. Bartlett, API vice-president for the Division of Marketing.

Mr. Bartlett, vice-president of Gulf Oil Corp., Pittsburgh, Pa., reported that the

general committee of the marketing division had given virtually unanimous approval to the new committee in a letter ballot. The committee consists of 29 members and two legal counsellors.

Generally speaking, the group is a service station dealer counterpart of the Jobber Advisory Committee appointed last fall and is a representative cross section of oil marketers, both functionally and geographically. It was set up to discuss, advise and counsel on broad matters of common interest to both dealers and suppliers.

The "charter" under which the committee is authorized to function states that it "shall strive to attain the objectives and engage in the activities shown below to the extent that it is legal to do so:

"1. It shall seek to foster, between service station operators and suppliers, a better understanding of each other's problems, needs, and points of view; and to review, in a spirit of friendliness, matters of common interest.

"2. It shall serve as the clearing house within the API to consider and counsel upon broad problems of both dealers and suppliers affecting generally retail distribution through service stations.

"3. It shall promote the study of, and the dissemination to dealers of information concerning, improvements in service station operation, personnel training and management, and in dealer understanding of influences generally affecting the service station business.

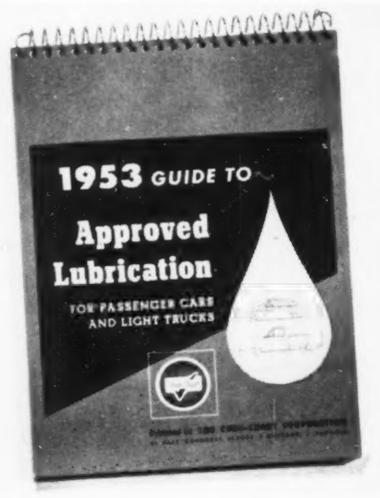
"4. It shall foster programs to establish public recognition of the dealer's important distributive functions; to encourage his participation in civic affairs as an essential member of the business community; and to promote the best interests of the motoring public.

"5. It may accomplish these objectives by recommendations, to established API committees and staff personnel, or by the appointment of special study groups.

"6. It shall abstain from any discussions, recommendations, or agreements concerning prices, margins, or contracts; or the supply arrangements for any dealer or group of dealers; nor shall it take action which may be violative of any law."

To insure the legal propriety of the activities of this committee, "its membership shall include at least one attorney who shall be in attendance at all meetings."

Lubrication Guide Introduces New 'Work-Saver' Charts



Unique "work-saver" lubrication charts, product of three years of development, appear for the first time in the "1953 Guide to Approved Lubrication for Passenger Cars and Light Trucks" now available from the publisher, The Chek-Chart Corporation of Chicago.

Organized on the basis of how lubrication work is actually done, the new charts make "follow-the-chart" lubrication easier than ever before without sacrificing thoroughness or accuracy. According to Ray Shaw, Chek-Chart president, the new charts simplify lubrication work for beginners as well as experienced men and at the same time help assure correct, manufacturer-approved lubrication for every popular make of car and light truck with minimum time and effort.

Keyed to the automotive service market, Chek-Chart's 144-page edition for 1953 includes charts for a greater percentage of the cars and light trucks actually in use, including all 1953 models. Up-to-date, redesigned charts cover passenger cars from 1953 back through 1941. In addition, charts covering 1940 through 1938 models of Chevrolet, Ford and Plymouth cars are included. Coverage of light truck models is similarly extended in the new edition.

Like previous editions, Chek-Chart's new guide for 1953 is a complete, all-inclusive aid to correct lubrication. Another set of pages presents a pictorial, step-by-step lubrication procedure and similar procedures for locating the need

for TBA replacements and other special services.

A completely new Service Instruction section gives step-by-step procedures for servicing all points shown on all of the individual charts. The section includes a tabular, step-by-step procedure that covers all Automatic Transmissions; applies to level check and draining the units.

The edition is wire spiral bound across the top; a specially designed wire hanger comes with each copy—makes it possible to hang the guide under the car, close to the job. The unit price for Chek-Chart's 1953 edition includes a one year subscription to the firm's publication, The Service Bulletin. Regular departments in the publication keep Guide users up-to-date throughout the year on changes in lubrication recommendations; changes in service procedures.

Emery Develops Simpler Composition Method

Emery Industries, Inc., has developed a simplified procedure for determining the composition of commercial stearic and palmitic acids.

Based on titer and iodine value tests only, the method is claimed to provide an accuracy within 1½%. This is compared to an accuracy of 1% normally obtained by more complex fractional distillation methods.

The test procedure and necessary curves are contained in a technical bulletin titled, "Rapid Composition Analysis of Commercial Stearic Acids", and is available on request from:

Emery Industries, Inc.
Dept. 5 Carew Tower
Cincinnati 2, Ohio

Disposal of Refinery Wastes Is New Manual Issued by API

The oil industry's continuing program to protect water resources adjacent to petroleum refineries was given fresh impetus with publication of the Fifth Edition of Volume I of the API Manual on Disposal of Refinery Wastes.

It was prepared by the Division of Refining of the American Petroleum Institute. The Manual on Disposal of Refinery Wastes is in five volumes designed to provide refiners with technical information to assist them in preventing the escape of noxious or harmful materials beyond plant fences.

Volume I, Waste Water Containing Oil, deals with the collection and treatment of waste water so that it will not contaminate adjacent rivers and streams when it is released. The last edition was published in August 1949.

New information in the Fifth Edition, which is now available through the Institute's offices in New York, includes the latest design data for gravity-type oil-water separators. This information is based on three years of research and experimentation at the University of Wisconsin under the direction of Prof. G. A. Rohlich.

The Fifth Edition is priced at $2.00 per copy. Other handbooks in the same series are as follows: Volume II—Waste Gases and Particulate Matter (Fourth Edition); Volume III—Chemical Wastes (Second Edition); Volume IV—Sampling and Testing of Liquid Wastes (First Edition in preparation); Volume V—Sampling and Testing of Waste Gases and Dusts (First Edition in preparation).

FUTURE MEETINGS of the Industry

MAY, 1953

14-23 International Petroleum Exposition, Tulsa, Okla.

17-19 Empire State Petroleum Assn., The Roosevelt, New York, N. Y.

18-19 American Petroleum Institute (Committee on Agriculture, annual field trip), Iowa State College, Ames, Iowa.

18-21 Oil Industry Information Committee, Ambassador Hotel, Los Angeles, Calif.

18-22 National Fire Protection Assn. (annual meeting), Palmer House, Chicago, Ill.

22 Virginia Oilmen's Assn. (annual convention), John Marshall Hotel, Richmond, Va.

25-29 American Socy. of Mechanical Engineers (annual conference and exhibit, oil and gas power division), Schroeder Hotel, Milwaukee, Wis.

28-29 Western Petroleum Refiners Assn. (regional meeting), Broadview Hotel, Wichita, Kans.

JUNE, 1953

2-3 American Petroleum Institute (Division of Production, Pacific Coast District spring meeting), Hotel Statler, Los Angeles, Calif.

4-5 Kentucky Oil & Gas Assn. (annual meeting), Lafayette Hotel, Lexington, Ky.

7-12 Socy. of Automotive Engineers (summer meeting), The Ambassador and Ritz-Carlton, Atlantic City, N. J.

15-19 American Petroleum Institute (Division of Production, midyear committee conference), Hotel William Penn, Pittsburgh, Pa.

18-19 Pennsylvania Grade Crude Oil Assn. (annual meeting), William Penn Hotel, Pittsburgh, Pa.

18-19 Western Petroleum Refiners Assn. (regional meeting), Conrad Hilton Hotel, Chicago, Ill.

25-26 Rocky Mountain Oil and Gas Assn. (midyear director's meeting), Utah Hotel, Salt Lake City, Utah.

28 to July 2 Petroleum Equipment Suppliers Assn. (annual meeting), Broadmoor Hotel, Colorado Springs, Colo.

29 to July 3 American Socy. for Testing Materials (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

AUGUST, 1953

17-19 Socy. of Automotive Engineers (international West Coast meeting), Georgia Hotel, Vancouver, B. C., Canada.

18-21 National Congress of Petroleum Retailers, William Penn Hotel, Pittsburgh, Pa.

SEPTEMBER, 1953

6-11 American Chemical Society (124th national meeting), Conrad Hilton Hotel, Chicago, Ill.

9-11 Oil Industry Information Committee, Cleveland Hotel, Cleveland, Ohio.

13-16 American Inst. of Chemical Engineers, Fairmont and Mark Hopkins Hotels, San Francisco, Calif.

14-17 Socy. of Automotive Engineers (National Tractor Meeting and Production Forum), Schroeder Hotel, Milwaukee, Wis.

15-16 American Petroleum Institute (Executive Committee), Greenbrier Hotel, White Sulphur Springs, W. Va.

16 American Petroleum Institute (Division of Marketing, Lubrication Committee meeting), The Traymore, Atlantic City, N. J.

16-18 National Petroleum Assn. (51st annual meeting), The Traymore, Atlantic City, N. J.

21-23 American Trade Assn. Executives (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

24-25 Western Petroleum Refiners Assn. (regional meeting), Henning Hotel, Casper, Wyo.

27-29 National Assn. of Oil Equipment Jobbers (annual meeting), Neil House, Columbus, Ohio.

29 to Oct. 3 Socy. of Automotive Engineers (national aeronautic meeting), Statler Hotel, Los Angeles, Calif.

OCTOBER, 1953

5-7 Texas Mid-Continent Oil and Gas Assn. (34th annual meeting), Rice Hotel, Houston, Texas.

7-9 National Assn. of Corrosion Engineers, South Central Region (annual meeting), Mayo Hotel, Tulsa, Okla.

11-17 Oil Progress Week.

14-15 Indiana Independent Petroleum Assn. (fall convention), Severin Hotel, Indianapolis, Ind.

15-16 Petroleum Marketers Assn. of Texas (annual meeting), Adolphus Hotel, Dallas, Tex.

19-20 Independent Petroleum Assn. of America (annual meeting), Hotel Texas, Ft. Worth, Tex.

FUTURE MEETINGS

OCTOBER, 1953

19-23 National Safety Congress, Conrad Hilton, Congress, Morrison, Sheraton, Chicago, Ill.

22-23 Western Petroleum Refiners Assn. (regional meeting), Garrett Hotel, Eldorado, Ark.

26-28 National Lubricating Grease Institute, 21st Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

28-29 Independent Oil Compounders Association, 6th Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

29-30 Socy. of Automotive Engineers (international production meeting), Royal York Hotel, Toronto, Ontario, Canada.

NOVEMBER, 1953

2-4 Socy. of Automotive Engineers (national transportation meeting), Conrad Hilton Hotel, Chicago, Ill.

2-4 American Oil Chemists' Socy. (27th fall meeting), Sherman Hotel, Chicago, Ill.

3-4 Socy. of Automotive Engineers (national diesel engine meeting), Conrad Hilton Hotel, Chicago, Ill.

4-5 Nebraska Petroleum Marketers (annual convention), Paxton Hotel, Omaha, Nebr.

5-6 Socy. of Automotive Engineers (national fuels and lubricants meeting), Conrad Hilton Hotel, Chicago, Ill.

9-11 The Geological Society of America (annual meeting), Royal York Hotel, Toronto, Ontario, Canada.

9-12 American Petroleum Institute (33rd annual meeting), Conrad Hilton Hotel and Palmer House, Chicago, Ill.

29-Dec. 4 American Socy. of Chemical Engineers, Statler Hotel, New York, N. Y.

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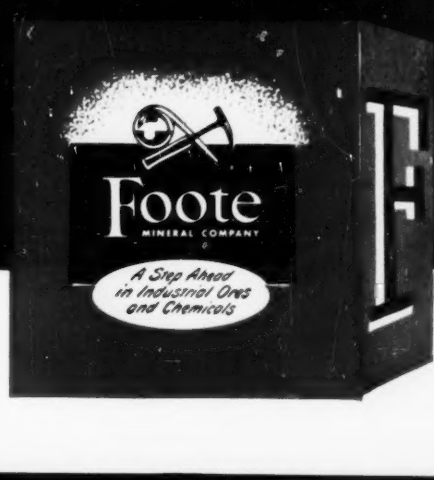

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